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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
HIDEKI SAKAI : EXAMINER: HANOR, SERENA L.  
SERIAL NO: 10/593,712 :  
FILED: SEPTEMBER 21, 2006 : GROUP ART UNIT: 1793  
FOR: ANATASE-TYPE TITANIUM :  
OXIDE POWDER AND METHOD FOR  
PRODUCING SAME

DECLARATION UNDER 37 C.F.R. §1.132

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

Now comes Hideki SAKAI, who deposes and states that:

1. I am a graduate of The Graduate School of Electro-Communications and received my degrees in the years 1986 (Master's degree) and 1994 (Ph.D.).
2. I have been employed by Toho Titanium Co., Ltd. for 12 years as a Senior Engineer in the field of titanium oxide powder.
3. I understand the English language or, at least, that the contents of the Declaration were made clear to me prior to executing the same.

4. The original specification includes Examples 1-3 and Comparative Examples 1-3. These examples were produced and analyzed according to the description on page 8, line 11, to page 14, line 8. In order to provide comparisons with the Examples and Comparative Examples of the original specification, the following Supplemental Experimental Examples 1-4 were produced and analyzed as described on page 8, line 11, to page 14, line 8. The following tables include original Example 1-3 and original Comparative Examples 1-3 as well as the new Supplemental Experimental Examples 1-4.

Process Conditions

	Claim	Example			Comparative Example			Supplemental Experimental Example			
		1	2	3	1	2	3	1	2	3	4
Preheating temperature (°C)	450-600°C	500	←	←	←	800	400	600	600	500	500
TiCl <sub>4</sub> feed rate (L/min)	-	0.5	←	←	←	←	←	0.5	0.5	0.5	0.5
H <sub>2</sub> feed rate (L/min)	-	40	←	←	95	40	20	40	40	30	40
Amount of H <sub>2</sub> per 1 L of TiCl <sub>4</sub> (L)	60-90L	80	←	←	190	80	40	80	80	60	80
O <sub>2</sub> feed rate (L/min)	-	40	←	←	95	40	20	40	40	30	40
Amount of O <sub>2</sub> per 1 L of TiCl <sub>4</sub> (L)	60-90L	80	←	←	190	80	40	80	80	60	80
Steam feed rate (L/min)	-	130	200	300	350	130	110	150	200	130	130
Amount of steam per 1 L of TiCl <sub>4</sub> (L)	240-400L	260	400	600	700	260	220	300	400	260	260
Reaction temperature (°C)	-	600	←	←	←	←	←	600	600	600	500

Product (titanium dioxide powder) Properties

	Example			Comparative Example			Supplemental Experimental Example			
	1	2	3	1	2	3	1	2	3	4
Average particle diameter (nm)	70	50	40	12	50	-	70	50	65	40
Rutile content (%)	4.6	2.2	4.2	8.6	92.2	-	8.0	5.0	4.0	3.4
Specific surface area (m <sup>2</sup> /g)	26.0	33.3	42.4	86.2	30.5	-	23.0	28.0	30.0	25.0
D90	1.80	1.18	2.08	2.65	1.85	-	1.10	0.96	0.95	1.29
D50	0.60	0.44	0.41	0.40	0.54	-	0.47	0.33	0.30	0.49
D10	0.18	0.15	0.14	0.10	0.20	-	0.15	0.13	0.10	0.14
SPAN	2.7	4.9	4.7	6.4	3.1	-	2.0	2.5	2.8	2.3

5. As can be seen from Examples 1 and 2 as well as Supplemental Experimental Examples 1-4, when an anatase-type titanium oxide powder is produced according to the claimed parameters (i.e., within the claimed ranges for the preheating temperature and

amounts of O<sub>2</sub>, H<sub>2</sub> and steam), titanium dioxide powders with controlled specific surface area (i.e., 23.0-33.3 m<sup>2</sup>/g) and low rutile content (i.e., 2.2-8.0%) were obtained.

6. In contrast, Example 3 as well as Comparative Examples 1-3, which include preheating temperatures and amounts O<sub>2</sub>, H<sub>2</sub> and steam outside the claimed ranges, result in either no titanium dioxide powder at all (i.e., Comparative Example 3) or titanium dioxide powders with a high rutile content (i.e., Comparative Example 2 - 92.2%) or an uncontrolled specific surface area (i.e., Example 3 and Comparative Example 1 - 42.4 and 86.2 m<sup>2</sup>/g respectively).

7. The above comparisons between embodiments shows that the claimed preheating temperature and the claimed amounts of hydrogen, oxygen and steam are critical.

8. Furthermore, I believe that the properties exhibited by the claimed invention as discussed above (e.g., controlled specific surface area and low rutile content) are both unpredictable and unexpected in view of the art.

9. The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

10. Further deponent saith not.

Hideki Ishii

Signature

04/22/2009

Date